# 98-D-125, Tritium Extraction Facility, Savannah River Site Aiken, South Carolina

(Changes from FY 2000 Congressional Budget Request are denoted with a vertical line [ | ] in the left margin.)

## Significant Changes

| # This Construction Project Data Sheet (CPDS) revised the baselines submitted in the FY 2000 Budget Request. This CPDS better reflects the progress, restrictions, and updated information now available to the Tritium Extraction Facility (TEF) Project. The FY 2000 CPDS was based on completed conceptual design of the TEF. This CPDS is based on completion of preliminary design, and reflects recent experience in estimated costs for competitively procured gloveboxes which are long-lead items essential to the facility. Also, this CPDS better accounts for changes to the TEF Project schedule which were necessary because of Congressional prohibitions against construction of any tritium supply facilities during FY 1999. Included in this schedule revision is a change in strategy for procuring facility design, engineering, and construction services. To meet the FY 2006 completion date, these services will no longer be procured as a fixed price package, but as a series of fixed price subcontracts issued by the Savannah River Site. Taken as a whole, the changes discussed above are significant enough that DOE has rebaselined the TEF Project and the total estimated cost (TEC) of the project will increase from $285.65 million to $323 million. Other project costs (OPC) will decrease so that the TEF total project cost (TPC) will increase by only $10.35 million. Section 4 of this CPDS provides details of these cost adjustments.

## 1. Construction Schedule History

| | Fiscal Quarter | | | | Total Estimated Cost ($000) | Total Project Cost ($000) |
|---|---|---|---|---|---|---|
| | A-E Work Initiated | A-E Work Completed | Physical Construction Start | Physical Construction Complete | | |
| FY 1998 Budget Request *(Preliminary Estimate)* . . . . . | 1Q 1998 | 4Q 2002 | 1Q 1999 | 3Q 2005 | TBD [a] | TBD |
| FY 2000 Budget Request . . . . . | 1Q 1998 | 3Q 2001 | 1Q 2000 | 4Q 2004 | 285,650 | 390,650 |
| FY 2001 Budget Request *(Revised Baseline Estimate)* . . . . . | 1Q 1998 | 3Q 2001 | 1Q 2000 | 4Q 2004 | 323,000 | 401,000 |

[a] Consistent with OMB Circular A-11, Part 3, full funding was requested for only preliminary and final design of the CLWR TEF in FY 1998.

## 2. Financial Schedule

(dollars in thousands)

| Fiscal Year | Appropriations | Obligations | Costs |
|---|---|---|---|
| 1998 | 9,650 | 9,650 | 6,911 |
| 1999 | 6,000 | 6,000 | 5,889 |
| 2000 | 32,875 [a] | 32,875 | 35,725 |
| 2001 | 75,000 | 75,000 | 73,011 |
| 2002 | 81,125 | 81,125 | 70,369 |
| 2003 | 55,000 | 55,000 | 63,233 |
| 2004 | 53,000 | 53,000 | 57,230 |
| 2005 | 10,000 | 10,000 | 10,282 |
| 2006 | 350 | 350 | 350 |

## 3. Project Description, Justification and Scope

Tritium is a radioactive isotope of hydrogen used in all of the Nation's nuclear weapons. Without tritium, nuclear weapons will not work as designed. At present, no tritium is produced by the U.S. for the nuclear weapons stockpile. Radioactive decay depletes the available tritium by approximately 5.5% each year. In order for these weapons to operate as designed, tritium must be periodically replaced. Although tritium has not been produced by the U.S. for the stockpile since the shutdown of the last production reactor in 1988, tritium requirements have been met through reuse of tritium recovered from dismantled weapons. In order to maintain the Strategic Arms Reduction Treaties (START) 1 force structure and five-year reserve approved by the President in the 1996 Nuclear Weapons Stockpile Memorandum, a new production capability should come on line approximately 2005. To meet this date, site preparation and construction of the Tritium Extraction Facility (TEF) must begin in FY 2000. As part of the dual track production strategy, stated in the Record of Decision for the Tritium Supply and Recycling Final Programmatic Environmental Impact Statement, issued on December 5, 1995, the Commercial Light Water Rector (CLWR) Tritium Extraction Facility shall be constructed at the Savannah River Site. The CLWR TEF shall provide the capability to receive and extract gases containing tritium from CLWR Tritium Producing Burnable Absorber Rods (TPBAR), or other targets of similar design. The TEF will provide shielded remote TPBAR handling for the extraction process, clean-up systems to reduce environmental impact from normal processing and accidental releases, and delivery of extracted gases containing tritium to the Tritium Recycle Facility for further processing.

The TEF will consist of a concrete industrial facility constructed partly below grade. The facility is divided into two major areas: (1) a 15,500 square foot remote handling area (RHA) and (2) a 26,500 square foot tritium processing building. The tritium processing building will be entirely above-ground; the floor of the RHA will be below grade. Major processes and operations systems included within the TEF will be: (1) the Receiving, Handling, and Storage System that will support all functions related the

[a]Original appropriation was $33,000,000. This was reduced by $125,000 for the FY 2000 rescission enacted by P.L. 106-113.

receipt, handling, preparation, and storage of incoming TPBAR and outgoing radioactive waste materials; (2) the Tritium Extraction System that will remove tritium and other gases from the TPBARs, remove contaminates from the gas stream, and store the tritium/helium mixture; (3) the Tritium/Product Process Systems that will separate and purify process gases from the irradiated TPBARs; (4) the Tritium Analysis and Accountability Systems that will support monitoring and tritium accountability; (5) the Solid Waste Management System that will receive solid waste generated by TEF for management and storage prior to disposal in the E-Area vaults; and (6) the Heating, Ventilation, and Air Conditioning System that would provide and distribute conditioned supply air to the underground RHA and the above ground tritium processing area and also discharge exhaust air to the environment via a 100-foot stack.

With CLWR as a basis, the TEF will provide steady-state production capability to the Tritium Recycle Facility (Building 233-H) of as much as 3Kg of tritium per year, if needed. Final purification of gases containing tritium shall be performed in the augmented process equipment located in the Tritium Recycle Facility.

The TEF shall have an operational life span of at least 40 years, minimize radiological and chemical releases to the environment; and minimize waste generation. The TEF security requirements shall be such that TEF is designated as an exclusion area and tritium processing facilities are to be located above ground.

**Project Milestones**

As baselined, the TEF will be dependent on the Tritium Modernization and Consolidation Project. With this project being completed during 3rd Quarter FY 2004, the final tritium systems will be available for processing extraction gases to ensure weapons stockpile requirements will be met in CY 2005.

FY 1998: Initiation of Preliminary Design
Completion of Preliminary Design
FY 1999: Critical Decision (CD) 2B Approval to Begin Final Design
Initiation of Final Design
CD-3 - Approval to Begin Construction
FY 2000: Initiation of Site Preparation
FY 2001: Completion of Final Design
Completion of Site Preparation
Initiation of Facility Construction
FY 2004 Completion of Facility Construction (Final system turnover to integrated system testing)
FY 2005: Initiation of Integrated System Testing with Tritium
FY 2006: Project Completion
CD-4 - Start of Facility Operations

## 4. Details of Cost Estimate [a]

(dollars in thousands)

| | Current Estimate | Previous Estimate |
|---|---|---|
| Design Phase | | |
| Preliminary and Final Design Costs (Design Drawings, Specifications and Construction Support) | 58,741 [b] | 33,100 |
| Design Management Costs (1.0% of TEC) | 3,092 | 1,649 |
| Project Management Costs (1.4% of TEC) | 4,404 | 4,520 |
| Total Design Costs (20.8% of TEC) | 66,237 | 39,269 |
| Construction Phase | | |
| Improvements to Land [c] | 4,719 | 3,082 |
| Buildings [c] | 61,329 | 125,508 |
| Special Equipment [c] | 75,377 | 14,212 |
| Standard Equipment [c] | 24,043 | 1,487 |
| Major Computer Items [c] | 3,496 | 6,047 |
| Inspection, Design and Project Liaison, Testing, Checkout and Acceptance [d] | 22,291 | 8,348 |
| Construction Management (2.5% of TEC) | 8,024 | 15,764 [b] |
| Project Management (2.4% of TEC) | 7,515 | 7,280 |
| Total Construction Costs (63.5% of TEC) | 206,794 | 181,728 |
| Contingencies | | |
| Design Phase (6.3% of TEC) [e] | 20,000 | 29,053 |
| Construction Phase (9.4% of TEC) [e] | 29,969 | 35,600 |
| Total Contingencies (15.7% of TEC) [e] | 49,969 | 64,653 |
| Net Federal total estimated cost (TEC) | 323,000 | 285,650 |

## 5. Method of Performance

The Savannah River Site M&O Contractor, Westinghouse Savannah River Company (WSRC) will be responsible for the design, construction, inspection and commissioning of the TEF to be built at the Savannah River Site. All conceptual and Preliminary Design work has been completed by site forces. Final Design will be performed by site forces. Based on competitive bid process, a general construction subcontractor will be selected to perform construction and checkout activities through non-radioactive gas testing. Start-up testing with radioactive gases will be performed by site forces.

[a] General and administrative overhead rates were calculated at a factor of 5% for TEC and 28% for OPC.

[b] Construction support previously included with construction management.

[c] Project strategy change from Design subcontractor to SRS Design resulted in equipment procurement responsibility residing with SRS and reallocation of certain costs from Buildings to Special and Standard Equipment; Increase in cost of gloveboxes reflected in special equipment costs.

[d] Increased scope for Construction subcontractor, scope previously included with SRS forces as operating costs.

[e] Reduction in contingency results from Preliminary Design completion.

## 6. Schedule of Project Funding

(dollars in thousands)

| | Prior Years | FY 1999 | FY 2000 | FY 2001 | Outyears | Total |
|---|---|---|---|---|---|---|
| Project Cost | | | | | | |
| Facility Cost | | | | | | |
| Design [a] | 6,911 | 5,889 | 27,725 | 45,712 | 0 | 86,237 |
| Construction | 0 | 0 | 8,000 | 27,299 | 201,464 | 236,763 |
| Total, Line item TEC | 6,911 | 5,889 | 35,725 | 73,011 | 201,464 | 323,000 |
| Total Facility Costs (Federal and Non-Federal) | | | | | | |
| Other Project Costs | | | | | | |
| Conceptual design cost | 3,541 | 0 | 0 | 0 | 0 | 3,541 |
| NEPA documentation costs | 1,858 | 0 | 0 | 0 | 0 | 1,858 |
| Other project costs | 5,601 | 3,000 | 2,000 | 1,000 | 61,000 | 72,601 |
| Total, Other Project Costs | 11,000 | 3,000 | 2,000 | 1,000 | 61,000 | 78,000 |
| Total, Project Cost (TPC) | 17,911 | 8,889 | 37,725 | 74,011 | 262,464 | 401,000 |

## 7. Related Annual Funding Requirements

(dollars in thousands)

| | Current Estimate | Previous Estimate |
|---|---|---|
| Annual facility operating costs | 1,550 | 1,550 |
| Annual facility maintenance/repair costs | 2,500 | 2,500 |
| Programmatic operating expenses directly related to the facility | 6,800 | 6,800 |
| Capital equipment not related to construction but related to the programmatic effort in the facility | 700 | 700 |
| GPP or other construction related to the programmatic effort in the facility | 400 | 400 |
| Utility costs | 950 | 950 |
| Total related annual funding (operating from FY 2006 through FY 2045) | 12,900 | 12,900 |

[a]Design includes cost of engineered equipment.